

WHAT IS CLAIMED IS:

1. A process for producing a chlorine-containing alkane selected from the group consisting of pentachloroethane; 1,1,1-trifluoro-2,2,2-trichloroethane and 1,1,1,2-tetrachloro-2,2-difluoroethane by addition of chlorine to trichloroethylene in liquid phase to produce pentachloroethane, or by exchange of hydrogen for chlorine in gas or liquid phase to produce 1,1,1-trifluoro-2,2,2-trichloroethane from 1,1,1-trifluoro-2-chloroethane or 1,1,1-trifluoro-2,2-dichloroethane, or to produce 1,1,1,2-tetrachloro-2,2-difluoroethane from 2,2-difluoro-2-chloroethane, or to produce purified 1,1,1,3,3-pentafluorobutane from 1,1,1,3,3-pentafluorobutane that has been contaminated by unsaturated compounds with C-C double bonds or C-C triple bonds by chlorinating the unsaturated contaminating compounds, wherein a respective starting compound is contacted with elemental chlorine and irradiated with UV light having a wavelength of $\lambda \geq 280$ nm.
2. A process according to claim 1, wherein the process is carried out in the liquid phase.
3. A process according to claim 1, wherein the process is carried out at a temperature in the range from room temperature to 200°C.
4. A process according to claim 1, wherein the process is carried out at a pressure of 1 to 10 bar (absolute).
5. A process according to claim 1, wherein 1,1,1,3,3-pentafluorobutane is purified by converting unsaturated impurities into chlorine-containing impurities and separating the chlorine containing impurities.
6. A process according to claim 1, wherein elemental chlorine is used in an amount that is 0.9 times to 1.3 times the stoichiometrically required amount.